

## CLAIMS

1. An apparatus for treating liquid waste comprising:
  - (a) a vessel;
  - (b) an AC plasma torch mounted with the vessel; and
  - 5 (c) at least one nozzle mounted in the vessel, wherein the nozzle is positioned in the vessel to introduce liquid waste into or above a flame emitted by the AC plasma torch.
2. The apparatus for treating liquid waste of claim 1 wherein the nozzle is an air-atomizing spray nozzle.
- 10 3. The apparatus for treating liquid waste of claim 2 wherein the flame has a temperature exceeding about 6000°C.
4. The apparatus for treating liquid waste of claim 3 wherein the flame heats the vessel to a temperature of about 1370°C to about 1950°C.
5. The apparatus for treating liquid waste of claim 4 wherein AC plasma torch  
15 has a body, and the body of the AC plasma torch does not penetrate the vessel.
6. The apparatus for treating liquid waste of claim 5 wherein the nozzle is positioned to introduce the liquid waste into the zone of highest energy in the flame.
7. The apparatus for treating liquid waste of claim 1 further comprising:
  - 20 (a) a feeding system connected to the nozzle;
  - (b) at least one injector mounted in the vessel;
  - (c) an oxidant supply system connected to the injector; and
  - (d) a drain disposed within the vessel.
8. The apparatus for treating liquid waste of claim 7 further comprising:
  - 25 (a) an ejector-venturi scrubber connected with the vessel;
  - (b) a collecting tank connected with the ejector-venturi scrubber; and
  - (c) an absorber connected with the collecting tank.
9. The apparatus for treating liquid waste of claim 8 further comprising:
  - 30 (a) a thermal oxidizer system connected with the absorber comprising a thermal stack, an exhaust pipe, and a burner.

10. The apparatus for treating liquid waste of claim 8 further comprising:  
(a) an energy recovery system connected with the absorber.
11. The apparatus for treating liquid waste of claim 7 wherein the feeding system comprises a container, piping interconnecting the container and the nozzle,  
5 and a flow control system connected with the piping.
12. A method for treating liquid waste comprising:  
(a) providing an AC plasma torch;  
(b) providing liquid waste;  
(c) atomizing the liquid waste;  
10 (d) generating a plasma flame with the AC plasma torch; and  
(e) introducing the atomized liquid waste into or above the flame.
13. The method for treating liquid waste of claim 12 wherein the liquid waste comprises hazardous solvent waste.
14. The method for treating liquid waste of claim 13 further comprising:  
15 (a) dissociating the organic molecules of the gasified liquid waste into elemental components;  
(b) gasifying the atomized liquid waste; and  
(c) reforming the elemental components as carbon monoxide gas and hydrogen gas.
- 20 15. The method for treating liquid waste of claim 14 wherein the step of dissociating the organic molecules destroys the hazardous constituency of the organic portion of the liquid waste and is accomplished through pyrolysis of the liquid waste.
16. The method for treating liquid waste of claim 15 further comprising:  
25 (a) providing oxygen; and  
(b) combining the oxygen with the elemental components to form carbon dioxide gas.
17. The method for treating liquid waste of claim 15 further comprising:  
30 (a) cooling the carbon monoxide gas and hydrogen gas from a temperature of between about 1250°C and 1350°C to between about 40°C and 80°C;

(b) removing carbon particulate from the carbon monoxide gas and hydrogen gas; and

(c) separating any acid gases from the carbon monoxide gas and hydrogen gas.

5 18. A method for treating hazardous solvent waste comprising:

(a) providing a first source of hazardous liquid solvent waste;

(b) providing a first nozzle;

(c) providing an AC plasma torch;

(d) generating a flame from the torch; and

10 (e) injecting the solvent waste from the first source through the first nozzle directly into the flame.

19. The method for treating hazardous solvent waste of claim 18 further comprising:

(a) providing a second source of hazardous liquid solvent waste;

15 (b) providing a second nozzle; and

(c) injecting the solvent waste from the second source through the second nozzle directly into the flame.

20. The method for treating hazardous solvent waste of claim 19 wherein the solvent waste from the first source and the solvent waste from the second source are injected through the respective nozzles in an alternating manner.

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